

Conjunction Reduction Redux¹

Introduction

In (1) and (2), the word *and* occurs in a variety of different contexts-- conjoining, for example, Noun Phrases in (1a), Adjectival or Predicate Phrases in (2a), and sentences in (1b) and (2b). The various categories being conjoined have very different meanings. The names in (1a) refer to objects, the conjoined predicates in (2a) express properties, and the sentences conjoined in (1b) and (2b) express propositions. If the word *and* itself has a single meaning, how does it combine with such different categories to deliver their different meanings?

- (1) a. Donca and Mircea are Romanian.
b. Donca is Romanian and Mircea is Romanian.
- (2) a. Stefana is Hungarian and Romanian.
b. Stefana is Hungarian and Stefana is Romanian.

Well, the easy way out, which I will fall victim to, is to deny appearances and to say that *And* always connects sentences, with just the meaning of the truth-functional connective. Appearances to the contrary are disposed of as follows. We'll call logical form a representation where every lexical item gets the arguments it deserves. So, since *and*'s arguments are sentences, it must connect sentences at logical form. A surface coordination of Noun Phrases or Predicate Phrases is not interpretable as such. Rather, the logical forms for the a.-examples in (1) and (2) must be made to resemble their b.-counterparts. I'll call it Conjunction Reduction in homage to an earlier, simpler time and my crucial examples will try to evoke that era, but all I mean by it today is the claim that *and* in logical form is always the familiar sentential connective.

Now, as Peter Lasnik documents in his book, Conjunction Reduction has been known since Aristotle to be the wrong analysis. How could *and* always be a sentential connective when (3) does not mean the same thing as (4)? (3) makes sense, but its alleged logical form is nonsense.

- (3) Donca and Mircea met.
- (4) *Donca met and Mircea met.

The problem is not confined to the coordination of names or Noun Phrases. Conjunction Reduction seems to fail the coordination of predicates in (5) as well. On the relevant reading, (5) divides the Transylvanian Cabinet between nationalities, between those who are Hungarian and

¹ ROUGH DRAFT ALERT: Incorporate (1992) pp. 1-6, a useful discussion of generalized conjunction, and (1992) Appendix I, against Schwarzschild's evasion of multiply-ambiguous *and*.

those who are Romanian, but the alleged source in sentential coordination in (6) makes them all dual nationals.

- (5) The Transylvanians in the Cabinet are Hungarian(s) and Romanian(s).
- (6) The Transylvanians in the Cabinet are Hungarian(s), and the Transylvanians in the Cabinet are Romanian(s).

So the Greeks knew that phrasal conjunctions yielded meanings that were not reducible to a conjunction of sentences. When names are conjoined as in (3), each name refers to an object and it appears that that conjunction *Donca and Mircea* itself refers to an object, namely, the group or set that consists of exactly Donca and Mircea. In this case, *and* works like an operator that takes names for objects and forms a name for a third object, the appropriate set, as you see (7). It's the set that contains exactly those things that are either Donca or Mircea. It's then okay to say of this set or group that it met. So on this view the logical form for (3) is something like (8).

- (7) "Donca and Mircea" refers to $\{x : x = \text{Donca or } x = \text{Mircea}\}$.
 $\{x : x = \text{Donca or } x = \text{Mircea}\} = \{\text{Donca, Mircea}\}$
- (8) $\text{meet}(\{\text{Donca, Mircea}\}) (= (3))$.
Cf. $\text{meet}(\text{Donca}) \ \& \ \text{meet}(\text{Mircea}) (= (4))$.

Something similar is supposed to happen when predicates are conjoined as in (5). Let's say for the sake of concreteness, though I don't believe it, that predicates refer to sets. So, the predicate *Hungarian* refers to the set of Hungarians, and the predicate *Romanian*, to the set of Romanians. The phrasal conjunction of these predicates is then a predicate that refers to the set of exactly those that are either Romanian or Hungarian, as in (9).

- (9) "Hungarian" refers to $\{x : \text{Hungarian}(x)\}$. "Romanian" refers to $\{x : \text{Romanian}(x)\}$.
"Hungarian and Romanian" refers to $\{x : \text{Hungarian}(x) \text{ or } \text{Romanian}(x)\}$

To say, as in (5), that the Transylvanians in the Cabinet are Hungarian and Romanian is to say that they are among the set of Hungarians and Romanians.

If we allow ourselves to identify objects with their singleton sets, we can summarize the apparent behavior of the conjunction *and* in (3) and (5) as follows. These examples appear to show that *and* has a usage where it translates as a set-union operator, as in (10):

- (10) *And* as a set-union operator.

If α refers to **a** and β refers to **b**, then α *and* β refers to $\mathbf{a \cup b}$.

"Hungarian" refers to $\{x : \text{Hungarian}(x)\}$. "Romanian" refers to $\{x : \text{Romanian}(x)\}$.
"Hungarian and Romanian" refers to $\{x : \text{Hungarian}(x)\} \cup \{x : \text{Romanian}(x)\}$
 $= \{x : \text{Hungarian}(x) \text{ or } \text{Romanian}(x)\}$

“Donca” refers to Donca, and “Mircea” refers to Mircea. “Donca and Mircea” refers to $\text{Donca} \cup \text{Mircea} = \{\text{Donca}, \text{Mircea}\}$.

What Aristotle and his successors say, in effect, is that *and* cannot just be the truth-functional sentential connective, it has a meaning akin to set-union, in which guise it can appear conjoining the different kinds of phrases.

Well, let’s reconsider the argument against Conjunction Reduction. It has rejected the truth-functional sentential connective in favor of a set-union operator because (11) and (12) don’t mean the same thing.

- (11) Donca and Mircea met.
- (12) *Donca met and Mircea met.

The argument is really only as good as the premise that the logical form of natural language predicates is as impoverished as (13) and (14) show it to be.

- (13) $\text{meet}(\text{Donca and Mircea})$
- (14) * $\text{meet}(d) \ \& \ \text{meet}(m)$

But, recent work and the theory of plurals has shown that predicates are to be decomposed along lines originally suggested by Donald Davidsonian. On this view, the English predicate *meet* decomposes into a concept of events and relations, which I will call θ -rôles, which express how objects participate in the denoted events. The additional structure makes it possible to give (11) a logical form where indeed the conjuncts are propositions, those based on a θ -rôle as in (15).

- (15) $\exists e ((\text{Agent}(e,j) \ \text{and} \ \text{Agent}(e,m)) \ \& \ \text{meet}(e))$
- (16) * $\exists e(\text{Agent}(e,j) \ \& \ \text{meet}(e)) \ \text{and} \ \exists e(\text{Agent}(e,m) \ \& \ \text{meet}(e))$

According to (15), there is a meeting in which John participates as an Agent and so does Mary. You can see that *and* appears as a sentential connective. Assuming that distinct clauses introduce their own existential event quantifiers, the logical form for (12) will then resemble (16), which fails to relate John and Mary to the same meeting. This proves to be crucial in explaining the anomaly of (12). For, if it is shown that the conjuncts ascribe exclusive participation in an event, as suggested by the paraphrases in (17) and (18), then the anomaly of (12) is just the absurdity of asserting that John met alone and so did Mary.

- (17) There is an event such that in one part John is the only participant and in the other part Mary is the only participant and the whole event is a meeting.
- (18) There is an event in which John is the only participant and it is a meeting, and there is an event in which Mary is the only participant and it is a meeting.

Conjunction Reduction thus resists the argument against it. An argument which, it turns out, only argues for more abstract structure. Now of course to have parried an argument against Conjunction Reduction is not to have shown that it must be so. So I want to start with a semantic argument-- I'll call it the modal argument-- that *and must* be a propositional connective even where, as in (11), it most looks like an operator that ought to apply to objects to form groups or sets of them. The modal argument will also show that the propositions conjoined are based on θ -rôles, as the logical form in (15) suggests.

1. The propositional connective *and*

1.1. *And* is always a propositional connective

Chris Collins was the first to notice the significance of sentences like (19). Here I begin to evoke the Conjunction Reduction era. Notice that it contains a collective predicate like *meet* in (11) and so like (11), it would normally be taken to show that Conjunction Reduction is impossible.

- (19) The Columbia students and possibly the Harvard students formed the unbroken chain around the Pentagon.
- (20) The Columbia students formed the unbroken chain around the Pentagon, and possibly the Harvard students formed the unbroken chain around the Pentagon.

Indeed (19) and (20) do not mean the same thing. (19) is understood as the report of a demonstration at which an unbroken chain was formed around the Pentagon. The speaker is certain that Columbia students participated and allows that Harvard students may have as well. The intended interpretation is paraphrased by (21):

- (21) The Columbia students formed the unbroken chain around the Pentagon, or the Columbia students and the Harvard students formed the unbroken chain around the Pentagon.

Whereas (19) and its paraphrase (21) leave open the possibility that the Columbia students did not form the chain alone, (20) asserts that they did and in fact goes on to assert that it is possible that it was also formed by the Harvard students, which cannot be true. So, (19) is not a reduction from (20), an observation which, by the way, also excludes taking the phrase *and possibly the Harvard students* as simply a parenthetical in (19).

Sentence (19) seems to require reference to the set of Columbia and Harvard students just as (11) requires reference to the set containing Donca and Mirçea. But, what is the modal adverb doing in (19) if *and* is an operator that applies to objects to derive a set containing them? What object does *possibly the Harvard students* refer to? And doesn't the modal *possibly* itself take a proposition rather than an object such as the set of Harvard students?

Collins suggests a translation for the conjoined Noun Phrases along the lines of (22a), which is paraphrased in (22b). I would just ignore (22a) if I had to listen to this talk. You won't go wrong with just the paraphrase.

- (22) a. $[\iota X: [\iota Y: \forall y(Yy \leftrightarrow Cy)] [\forall y: Yy] Xy \ \& \ \text{Poss}[\iota Z: \forall z(Zz \leftrightarrow Hz)] [\forall z: Zz] Xz]$...
 b. (All) the persons(X) such that the Columbia students are among them(X) and possibly the Harvard students are among them(X) (and no one else)...

You can see there that the modal adverb *possibly* gets its proposition, viz., that Harvard students are among them, and the conjunction *and* turns out to be a propositional connective.

1.2. "Non-Boolean" *and* connects propositions based on θ -rôles

But this can't be right. The definite description in (22) is not the meaning of the subject in (19). To see this, consider first the simpler definite description in (23).

- (23) a. $[\iota X: \text{Poss}([\forall x: Xx] [\iota Z: \forall z(Zz \leftrightarrow Hz)] Zx)]$...
 b. (all) the persons that are possibly the Harvard students
 (all) the persons of whom it is possible that they are the Harvard students

Some persons are among those referred to by (23) just in case it is possible that they are the Harvard students. Of course the Harvard students are themselves such persons, and so they must be included in the reference of the definite description in (23). In the right circumstances, the definite descriptions might also refer to more than just the Harvard students. We need only imagine circumstances where there are some persons who are not Harvard students but it is consistent with all the known facts to think that they are. These facts about the reference of (23) carry over to (22) although the conjunction is a slight distraction.

First, the reference of (22) includes of course the Columbia students, but it also *must* include the Harvard students. The Harvard students escape only if it is *not* possible that the Harvard students are among those persons that are possibly Harvard students. Second, under the right conditions for mistaken identity, there could be some persons that include non-Harvard students (who are also not Columbia students) of whom a speaker knows that it is possible that they are the Harvard students. Under these conditions, those persons will also be included in the reference of (22). These observations show the failure of (22) to represent (19).

First, (19) does not entail that the Harvard students joined the unbroken chain around the Pentagon; but, a logical form like (22) would, the Harvard students being among the persons referred to. Second, (19) entails that an unbroken chain was formed by no one other than the Columbia students and possibly the Harvard students. (22) however allows others if it is possible that they are Harvard students. So, (22) is not the meaning of (19); and, we must look elsewhere for a logical form where *and* is a propositional connective and *possibly* gets an appropriate propositional complement.

Although Collins points to the conclusion that *and* is a propositional connective even where it is least expected, with collective subjects, he doesn't go far enough. Despite the occurrence of *and* as a propositional connective, the effect of conjunction is still to compose from the Noun Phrases, *the Columbia students* and *the Harvard students*, another Noun Phrase, the definite description shown in (22). But, recall the logical form for *Donca and Mircea met* in (24).

(24) $\exists e ((\text{Agent}(e,d) \text{ and } \text{Agent}(e,m)) \ \& \ \text{meet}(e))$

There is no conjunction internal to a Noun Phrase here. The scope of the conjunction includes structure from outside the Noun Phrases, namely, the thematic relation of being an Agent. Thus the conjunction of Noun Phrases *Donca and Mircea* does not compose a Noun Phrase meaning. The phrase is entirely syncategorematic in logical form. The possibility that (19) expresses is the possibility that the Harvard students joined the unbroken chain around the Pentagon. This will follow if the conjunction does not belong to the composition of a Noun Phrase meaning but conjoins instead propositions about the students' participation. The modal adverb then qualifies the participation of the Harvard students, as in (25):

(25) $\exists e (\text{Agent}(e, \text{the Columbia students}) \ \& \ \text{Poss}(\text{Agent}(e, \text{the Harvard students})) \ \& \ \text{form}(e) \ \& \dots)$

There was an event of forming an unbroken chain around the Pentagon, the Columbia students participated in it, and possibly the Harvard students did too. Some refinements of (25) will have to be introduced if it is to accurately represent (19); but, the basic structure will remain.

There is of course no reason to think that the conjunction is any different in the absence of a modal adverb. So, it is also a propositional connective in (26), the sort of example that is supposed to show the necessity of an *and* that forms groups of objects:

(26) The Columbia students and the Harvard students formed the unbroken chain around the Pentagon.

1.3. Conjoining θ -rôle-based propositions

The modal argument has more to say about the logical structure of conjoining Noun Phrases. Let's keep in mind that any sort of collective predication, as in (27), is subject to two constraints. First, it must be allowed that the individuals involved do different things, and second it must require that they do everything there is to do.

(27) The three Harvard students cooked up the Harvard beets.

One student salts the water, another slices the beets and the third stirs the pot. Each of these actions would not on its own amount to cooking up the beets; but, in concert, they get the job done. Sentence (27) would however be false if the three Harvard students did nothing but salt the water while some unknown others finished the job.

(28) $\exists e(\text{Agent}(e,h) \ \& \ \text{cook-up}(e) \ \& \ \text{Theme}(e,b))$

Referring to the set **h** of the three Harvard students and the set **b** of the Harvard beets, (28) is adequate provided that the theta roles are exclusive and exhaustive. That is, we should read the first conjunct as saying that **h** is *the* Agent in **e** and the last conjunct as saying that **b** is *the* Theme in **e**. Then, indeed these three Harvard students must have cooked up the Harvard beets since there can be no other Agents in the reported event and no other Themes. All there is to do is done by the group of Harvard students, and (28) is silent about what the individual student did, allowing that they may have contributed in different ways, as required.

(29) Biff and Tiff cooked up the Harvard beets.

Look to the conjoined subject in (29) and it stands in the same relation to the cooking event as (27)'s subject. Biff and Tiff may divide the tasks among themselves, and they are the only ones cooking. In this respect, the conjunction of singular terms behaves just like the plural definite description, as many have noticed. If the conjunction of Noun Phrases involved a union operator, the account of (29) would be the same: again, the Agent theta role applies uniquely to *the* Agent and the Noun Phrase conjunction refers to a set **h** that contains only Biff and Tiff, as in (30).

(30) *Biff and Tiff* refers to **h**, $\mathbf{h} = \{\text{Biff}, \text{Tiff}\}$.

But, the modal argument compels us to reject the union-operator *and*. The logical form for (29) is rather something along the lines of (31), in which the Agent theta role is predicated directly of Biff and of Tiff:

(31) $\exists e(\text{Agent}(e,b) \ \textit{and} \ \text{Agent}(e,t) \ \& \ \text{cook-up}(e) \ \& \ \dots)$

And now here's the problem. If I continue to hold that the theta role is exclusive and exhaustive, then (31) issues in the contradiction that Biff was the unique Agent in **e** and so was Tiff. I avoid the contradiction by retreating to a non-exclusive theta role that says only that Biff was *an* Agent in **e** and so was Tiff, but then (31) fails to say that Biff and Tiff taken together were *the* sole Agents cooking up the Harvard beets.

There are two ways we might restore to Biff and Tiff their role as exclusive Agent. The first allows the theta role to assert exclusivity, and to avoid contradiction, it divides the event into the part in which Biff was the sole Agent and the part in which Tiff was. This is what we see in the paraphrase in (32), where I assume quantification over sets of events. I could have talked about the parts of a single event instead.

(32) (Exclusive θ -role and a union of (groups of) events)

There are some events divided between those in which Biff is the Agent and those in which Tiff is the Agent and they are a cooking up of the Harvard beets.

“ $\exists e \exists e' \exists e'' (e = e' \cup e'' \& \text{Agent}(e', b) \& \text{Agent}(e'', t) \& \text{cook}(e) \& \dots)$ ”

Were I to state a semantics to derive the reading paraphrased in (32), *and* would of course not emerge as the familiar sentential connective, sneaking in as it would have to a union operation on sets of events. So I won't bother. But the paraphrase represents a natural approach that descends from the earlier account of (33) that allows us to divide the Transylvanian Cabinet between the Hungarians and the Romanians. In fact, Krifka and Moltmann, who view the semantic values of predicates to be pairs of object and event resort to something along these lines.

(33) The Transylvanians in the Cabinet are Hungarian(s) and Romanian(s).

But, I am arguing against any such appeal to a union operator in the semantics of *and*, and so for our purposes, it is enough to focus on the paraphrase in (32), however we might get there. What is of interest in (32) is that two features ensure that Biff and Tiff are the exclusive cooks of the Harvard beets. First, that the Agent theta role has the exclusive interpretation-- each of Biff and Tiff is said to be the only cook in his or her events-- and, second, that the cooking up of the Harvard beets is composed exactly of their individual events. From this it will follow that Biff and Tiff and only they did all that need to be done in cooking up the Harvard beets.

The above, again, seems to draw us into complicating the meaning of *and*. I will offer an alternative that allows *and* to remain the simple, sentential connective. Instead of complicating its meaning, I suggest that there is yet more structure hidden in logical form. So consider again (34) and (35):

(34) Biff and Tiff cooked up the Harvard beets.

(35) $\exists e (\text{Agent}(e, b) \text{ and } \text{Agent}(e, t) \& \text{cook-up}(e) \& \dots)$

I won't allow an exclusive theta role since it only leads to dividing up the event by some operator as we've just seen-- exactly what I would rather not do. Instead to avert a contradiction in (35), let's weaken the theta role so that (35) asserts only that Biff is *an* Agent in *e* and Tiff is *an* Agent in *e*. Now something needs to be said so that no one other than Biff and Tiff are Agents in this event. The addition to logical form will be a separate “remark” asserting their exclusivity. It takes the form of a definite description that refers back to just those events that Biff and Tiff participated in jointly or severally, as in (36). I will have a few words, but only a few words more to say here about this definite description. Take it on faith that an operator can be defined to give the meaning as paraphrased.

(36) (non-exclusive θ -role, cross-reference to events)

$\exists e (\text{Agent}(e, b) \text{ and } \text{Agent}(e, t) \& [\hat{E}: \text{Agent}(e, \text{they})] \text{cook-up}(e) \dots)$

In some event, Biff was an Agent *and* Tiff was an Agent, & exactly what they did there was a cooking-up of the Harvard beets.

The important thing is that exclusivity is asserted in (36) outside the scope of the sentential connective *and*. Now let us return to the interaction of Noun Phrase-conjunction and modal adverbs to show that a separate remark imposing exclusivity is necessary. By insisting on the one meaning for *and* as a sentential connective, we are led to discover a new aspect of logical form.

At first blush, the addition of a modal adverb presents no special problem for the first analysis that falls under (32). Sentence (37) comes out as paraphrased in (38). It has the virtue that the possibility expressed concerns the Harvard students' participation in the event, as argued for earlier.

(37) The Columbia students and possibly the Harvard students formed the unbroken chain around the Pentagon.

(38) $\exists e(\text{Agent}(e,c) \text{ and } \text{Poss}(\text{Agent}(e,h)) \ \&\dots)$

There are some events in some of which the Columbia students are the Agents and in the others of which it is possible that the Harvard students are the Agents, and those events are the forming of the unbroken chain around the Pentagon.

But, such logical form is not true to the meaning of (37)--as we'll soon see-- unlike a logical form which asserts exclusivity in a special "remark". Let's consider two sources of doubt that might lead a speaker to hedge his assertion that the Harvard students were involved, to say only that it was possibly so, as in (39):

(39) It is possible that the Harvard students were there.
It is possible that the Harvard students were (the) Agents there.

(40) Scenario I ("Call in the reinforcements"). The SDS organizers have planned that the Columbia students will surround the Pentagon and only if they are short-handed will the Harvard students join them. One of the Columbia students is to signal when the chain is finally completed. The SDS lookout, from a vantage point on one side of the Pentagon, sees the signal and only a thin blue line of Columbia students. Unable to see the other sides of the Pentagon but knowing from the signal that the mission is completed, the lookout believes (39) and so utters (37)-- which is true and felicitous.

(41) Scenario II ("Too few Columbia students and impostors among us"). The Harvard students at demonstrations are sometimes impostors. They have been known to hire substitutes to wear the crimson for them. The SDS lookout knows this and therefore believes nothing stronger than (39). Now, observing the demonstration, the lookout either sights crimson jerseys or calculates that the Columbia students are too few to encircle the Pentagon on their own. It is anyway certain that there are extra bodies

whatever doubt there may be about their identity, and the lookout knows therefore that the demonstrators are not only the Columbia students. It is infelicitous for the lookout to utter (37).

Here is the first scenario. Suppose that the SDS organizers have planned that the Columbia students will surround the Pentagon and only if they are short-handed will the Harvard students join them. One of the Columbia students is to signal when the chain is finally completed. The SDS lookout from a vantage point on one side of the Pentagon sees the signal and only a thin blue line of Columbia students. Unable to see the other sides of the Pentagon but knowing from the signal that the mission is completed, the lookout believes (39) and so utters (37), which is true. The lookout's uncertainty concerns whether or not the event referred to involves only the Columbia students. An uncertainty about the body count.

Second scenario. The Harvard students at demonstrations are sometimes impostors. They have been known to hire substitutes to wear the crimson for them. The SDS lookout knows this and therefore believes nothing stronger than (39). Now, observing the demonstration, the lookout either sights crimson jerseys or calculates that the Columbia students are too few to encircle the Pentagon on their own. It is anyway certain that there are extra bodies whatever doubt there may be about their identity, and the lookout knows therefore that the demonstrators are not only the Columbia students. Notice that in this scenario it would be entirely infelicitous for the lookout to utter (37). It's not hard to see why it is infelicitous. As pointed out earlier, (37) is equivalent to (42)--that there was a demonstration and the demonstrators were the Columbia students or maybe the Columbia students and the Harvard students.

(42) The Columbia students formed the unbroken chain around the Pentagon, or the Columbia students and the Harvard students formed the unbroken chain around the Pentagon.

So, why would a speaker assert such a disjunction knowing already one of its disjuncts to be false? Compare the simpler examples in (43) and (44). (44a) is unacceptable, it already being known that Biff could not have met.

(43) a. Biff, Miff and possibly Tiff met.
b. Biff and Miff met, or Biff, Miff and Tiff met.

(44) a. *Biff and possibly Tiff met.
b. *Biff met, or Biff and Tiff met.

The logical form that we settle on for (37) should allow us to explain why the sentence is felicitous in the first scenario but not the second. So, what if the logical form said what (38) says, which omits a separate remark about exclusivity? As far as I can tell, (38) would be true and appropriate in either scenario. After all, we have seen that (39) is true in either scenario. This is just the middle conjunct of (38) and the other two conjuncts are simply true. With a meaning like (38), it shouldn't matter which doubts prompt the speaker to hedge the assertion. Either that the Columbia students were insufficient or that the Harvard students were impostors.

But, if exclusivity is maintained in a separate remark, as it is (45a) and the paraphrase (45b), then the two scenarios are distinguished.

(45) a. $\exists e(\text{Agent}(e,c) \text{ and Poss Agent}(e,h) \ \& \ [\hat{E}: \text{Agent}(e, \text{they})] \text{ form}(e)\dots)$

b. In some event, the Columbia students were Agents and it is possible that the Harvard students were Agents and exactly what they (and no one else) did there was the forming of the unbroken chain around the Pentagon.

In the second scenario, the lookout sees crimson jerseys or calculates that the Columbia students are too few, and therefore knows that the Columbia students are not alone. It then follows from (45) --from the remark that no one other than Columbia or Harvard students are involved-- that the others, the non-Columbia students, must have been Harvard students. Of course the lookout in the second scenario does not intend this because he has reservations about the identity underneath those crimson jerseys. (45) is inconsistent with these reservations. Knowing for certain that not only Columbia students were involved, the use of "possibly" in (37) is infelicitous and cannot be grounded in suspicions about impostors.

This then is the objection to (38) as the meaning for (37). It deprives us of an account of (37)'s infelicity in the second scenario where the speaker knows that not only the Columbia students participated in the demonstration. An account is forthcoming when exclusivity is asserted as in (45) by a separate clause, one that does not fall within the scope of the modal *possibly*. It is not enough that exclusivity apply only within the two groups of events. It must apply to the events as a whole, and so the separate remark. With this separate remark in place, the conjunction *and* is itself nothing more than the familiar truth-functional connective.

You might wonder where does this new term in the logical form in (45) come from, the one that enforces exclusivity by referring to "exactly what they did". Well, it comes from things that you might already believe in. Verbs and the like decompose into an event concept and theta roles, as I have assumed throughout. Now I have argued elsewhere that this decomposition is itself syntactic rather than lexical, to further corroborate this point, we have just seen that *and* can have theta roles for its conjuncts. If these theta roles thus occur as syntactic expressions, then the syntax itself, that is, logical form, contains various argument positions to be occupied by empty categories, that is, unpronounced Noun Phrases, referring to events. In the citation form of the Davidsonian decomposition, these empty categories are assumed to be variables bound to the event quantifier. But, this assumption is unwarranted in the current climate. There is rather an expectation that empty, unpronounced elements should be able to do whatever their overt counterparts do and there is also an expectation that certain kinds of nominals have these null counterparts. In particular, it is hardly a stretch to say that there are null pronominals. Well, that's all I need, because pronouns do what I want. Just look at the English sentence in (46):

(46) Biff did something and possibly Tiff did something, and it caused the riot.

What does the pronoun refer to? If Tiff didn't do anything, then it refers to just what Biff did. If Tiff did do something, then it refers to just what Biff and Tiff did and not to what anyone else

did. The null pronoun, indicated by 'pro', does the same in (47), the logical form for *Biff and possibly Tiff caused the riot*.

- (47) Biff and possibly Tiff caused the riot.
 $\exists e (\text{Agent}(e,c) \ \& \ \text{Poss Agent}(e,h) \ \& \ \text{cause}(\text{pro}) \ \& \dots)$

It is a problem for the semanticist to explain how pronouns manage to refer in this way. Pronouns, despite appearances, have descriptive content, or so I believe. And so, I conceive of the semantics problem as one of choosing the right determiner (some variant of the definite determiner) and the right descriptive content. This complicates the resulting logical form and leads to circumlocutions like "whatever they did". But, any other account of the pronouns' reference in these contexts will do fine here. The fact is that pronouns mean what they mean and I say nothing more than that the null elements referring to events are pronominal. All I have done in (47) is replace the last variable e with the null pro-- a small thing really. Of course, if pronominal cross-reference to events is the correct way to derive exclusivity here, the antecedents are propositional-- hence, conjunction reduction.

So much for the conjunction of Noun Phrases. What about the cases of predicative conjunction such as (48), which are also supposed to require something other than a sentential connective? Recall that translating *and* as set-union is alleged to be necessary for the reading of (48) that *divides* the Harvard students between those that cooked up the beets and those that garnished them.

- (48) Three Harvard students cooked up the Harvard beets and garnished them with pearl onions.

A curious asymmetry arises when a modal adverb is introduced into the predicative conjunction as in (49):

- (49) Three Harvard students cooked up the Harvard beets and possibly garnished them with pearl onions.

If (49) is understood with the so-called full Conjunction Reduction reading, then like the paraphrase in (50), the grounds for using *possibly* remain fairly open.

- (50) Three Harvard students cooked up the Harvard beets, and possibly they garnished them with pearl onions.

It may be that the speaker is uncertain whether or not the beets were ever garnished, although if they were, she's certain it was the three Harvard students who did it. Or, it may be plain that the beets were garnished, and certain that three Harvard students cooked them, she nevertheless suspects that the three she later saw with the garnish were impostors.

In contrast, now consider the apparent set-union reading of (49) (which of course cannot be paraphrased as in (50)). Here we explicitly mean to allow that the Harvard students be divided

between the cooks and the garnishers. As we have seen earlier, the possibility conveyed seems to render the sentence equivalent to a disjunction, the one in (51).

- (51) Three Harvard students cooked up the Harvard beets, or three Harvard students cooked up the Harvard beets and garnished them with pearl onions.

Something went on. It was at least a cooking up of the Harvard beets and maybe also a garnishing, and three Harvard students did it. No impostors here. If there was no garnish, then three Harvard students did what was left to do, the cooking. (49) would not be felicitous if it were *known* that the one Harvard student Biff cooked up the beets by himself and *suspected* that Yalies Eli and Nathan posing as Harvard students Miff and Tiff garnished the beets with pearl onions and who knows what else. On the other hand, the so-called full Conjunction Reduction interpretation, paraphrased in (50) is appropriate on analogous conditions: it is known that Biff, Miff and Tiff cook up the Harvard beets and suspected that Eli, Nathan and Bull posing as them did the garnish.

Now this is quite puzzling. The lexical item *and* is said to translate as set-union and this allows us when conjoining Predicate Phrases as in (48) to accept the sentence as true when the Harvard students are divided between those that satisfy the first conjunct, cooking up the Harvard beets, and those that satisfy the second conjunct, garnishing the beets with pearl onions. But, if we replace the second conjunct with a Predicate Phrase modified by a modal adverb as in (49), the interpretation fails. If *and* could just be some sort of set-union that applied to Predicate Phrases, it should be okay to divide the Harvard students between those that cooked and those of whom it is possible that they (or their impostors as the case may be) garnished the beets. It isn't okay, but there isn't set-union here, and *and* has only its truth-functional meaning. So when some meaning comes along that looks like there's a union operator, it must be that a rather different structure is involved. For the conjunction of Predicate Phrases in (49), we have just a backwards null pronominalization referring to the events described by the conjunction as in (52):

- (52) (to be revised)

$\exists e(\text{Agent}(h, \text{pro}) \ \& \ \text{cook}(e) \dots \text{and} \ \text{Poss}(\text{garnish}(e) \ \& \ \text{Theme}(e,b) \ \& \ \text{With}(e, o)))$

There were Harvard beets cooked up and possibly they were garnished with pearl onions, and it was done by the Harvard students.

If the beets were cooked and garnished, then the pronoun in (52), *pro* in the notation and 'it' in the paraphrase, refers to exactly that; and if there was no garnish, then the pronoun refers to just the cooking. Since nothing referring to the students falls within the scope of *possibly*, questions about their true identity are irrelevant. And indeed whatever the pronoun does refer to, whether it's cooking and garnishing or just cooking, the Harvard students, themselves, not impostors, must all be Agents in it. There is a problem here which I return to presently, but there you have it-- Conjunction Reduction restored and *and* the unambiguous truth-functional connective, all for the price of a null pronominal that cross-refers to events. It's just what the meaning of modal adverbs requires.

When Noun Phrases are conjoined, the conjunction is resolved as in (53) and the null pronominal refers to whatever the Harvard students and Columbia students did as Agents. In the case of the conjoined Predicate Phrases in (54), *and* conjoins propositions with more content than just theta roles, and the null pronominal referring to the events described refers to the cooking up of the Harvard beets and their possible garnishing.

(53) The Columbia students and possibly the Harvard students formed the unbroken chain around the Pentagon.

$\exists e(\text{Agent}(e_i, c) \text{ and Poss}(\text{Agent}(e_i, h)) \ \& \ \text{form}(pro_i) \dots)$

(54) The three Harvard students cooked up the Harvard beets and possibly garnished them with pearl onions.

$\exists e(\text{Agent}(h, pro_i) \ \& \ [\text{cook}(e_i) \dots \text{ and Poss}(\text{garnish}(e_i) \dots)])$

Now here is the problem just alluded to and the refinement that its solution suggests. Recall that the theta roles are not exclusive. I have just supposed that the pronominal in (54), *pro*, refers to the event of the Harvard beets being cooked up and possibly garnished with pearl onions. As it stands, (54) says that the Harvard students were Agents, merely *some* Agents in this event. But, this is inadequate, since it would allow the Harvard students to participate only by salting the water while all the art in preparing this dish is left to some unnamed Yale students. Again, we must somehow guarantee that the Harvard students are the exclusive agents. Our method for doing so has already been determined. There must be now another null pronominal that refers to exactly what the Harvard students did, to the event of their being Agents. So we are left holding two pronouns that refer to events. One refers to an event of the Harvard beets being cooked up and possibly garnished with pearl onions, and the other refers to an event of the Harvard students being Agents. We have these two pronouns in need of a relation between them, something that says, in effect, that the event of their agency *caused* the preparation of the Harvard beets, which is what you see in (55), where I have introduced ‘C’ as the causal relation between these events.

(55) (still to be revised)

$\exists e \exists e'(\text{Agent}_i(e, h) \ \& \ C(pro_i, pro_j) \ \& \ [\text{cook}(e') \dots \ \& \ \text{Poss}(\text{garnish}(e') \dots)])$

The Harvard student acted, there were Harvard beets cooked up and possibly garnished with pearl onions, and that (the Harvard students’ acting) caused that (the Harvard beets being cooked up and possibly garnished with pearl onions).

Having revived Conjunction Reduction, I guess you could have suspected that ‘kill’ as ‘cause-to-die’ was not far behind, although I don’t think any of the old generative semanticists saw any connection between these old favorites. My point here is that the conclusion that *and* is univocally the sentential connective leads us unavoidably to the view that transitive sentences are always to be analyzed as nesting small clauses, as in the causative analysis.

When we turn to the case of multiple conjunctions within a given sentence as in (65) there is yet more evidence for the causative analysis of transitivity, coming again entirely from

within the logic of conjunction. The case is also interesting for what more it will tell us about the structure of conjoined Predicate Phrases.

(56) (Multiple conjunctions)

The Columbia students and the Harvard students surrounded the Pentagon and were crowded into the Mall.

The interpretation of (56) does not differ much from the sentences we have already seen. The relevant interpretation, perhaps its most salient, asserts that the Pentagon was surrounded and the Mall was filled with protestors and the participants in these events were the Columbia and Harvard students. It does not suppose that either the Columbia students or the Harvard students accomplished either of these tasks without the other. Nor does it guarantee that either the Columbia students or the Harvard students participated in both events. It asserts merely that there were the Columbia students and the Harvard students, and what they did was surround the Pentagon and fill the Mall, some of them around the Pentagon and some on the Mall. The sentence is vague about who joined which activity. Perhaps the Columbia students all ended up at the Pentagon and the Harvard students, all on the Mall. We don't know.

This last observation makes the interpretation difficult to represent if the scope of the Noun Phrase-conjunction is based solely on the θ -rôles of surrounding the Pentagon and being crowded into the Mall, which I take to be different, say, Agent and Theme. To conjoin the θ -rôles would assert that each school was represented at both events, as in (57):

(57) $\exists e$ ([The x: Cx] (Agent(e, x) *and* Theme(e,x)) *and*
[The y: Hy] (Agent(e, x) *and* Theme(e,x))...& surround(e)...& fill(e)...)

But this is mistaken, since we allow that either school might have been absent from one or the other event. Were we to express the meaning of (56) using only the given θ -roles, Agent and Theme, some way would have to be found to introduce a disjunction, as in (58).

(58) $\exists e$ ([The x: Cx] (Agent(e, x) *or* Theme(e,x)) *and*
[The y: Hy] (Agent(e, x) *or* Theme(e,x))...& surround(e)...& fill(e)...)

There were some events such that the Columbia students were chain-formers or Mall-fillers, and so were the Harvard students, and whatever they did as chain-formers or Mall-fillers was a forming of a chain around the Pentagon and a filling the Mall with protestors.

But, I do not quite see how it would work out that a conjunction of Predicate Phrases gives rise to a disjunction when it combines with a Noun Phrase-conjunction. Instead, following much recent syntax, I will assume that a verb and its dependent theta roles such as an Agent and Theme are contained in a VP that sits at the bottom of an unknown number of higher projections such as the XP in (59). The idea, as many of you know, is that the subject of any clause moves from the subject position of the Verb Phrase through the subject positions of these faint XPs in the same way as it moves from the one overt clause to the next in (60). So much I can borrow

from syntax. I will suppose further that at least one of the higher projections through which the subject moves might mean something and provide an appropriate thematic relation, call it ‘W’. It is this ‘W’ that allows the *and* inside the Noun Phrase-conjunction in (56) to emerge as a conjunction of sentences. The theta roles, Agent and Theme remain in their proper Verb Phrases, something like (61).

(59) $[_{XP}(W) [_X X \dots [_{VP}(\text{Agent}) [_V V (\text{Theme}) \dots]]]]$

(60) [Donca and Mircea_i [seem[*t_i* acquainted]]]

(61) $\exists e (W(e,c) \text{ and } W(e,h) \ \& \ [\exists x \text{Agent}(e, x) \ \& \ \text{surround}(e) \ \dots] \ \text{and} \ [\exists x \text{Theme}(e, x) \ \& \ \text{crowd}(e) \ \& \ \text{Into}(e,m)])$

The Columbia students were there and the Harvard students were there, and it was a surrounding of the Pentagon and a crowding into the Mall.

The meaning of ‘W’ has to be rather weak if it is to be compatible with any old Verb Phrase. I take it to express a vague participation relation or to act like some kind of presentational verb. It holds of any object *x* and an event *e* just in case *x* is in *e*, which is all that the first clause of the paraphrase in (61) conveys. Note that if the Columbia students’ and the Harvard students’ being there is, or completely overlaps, the surrounding of the Pentagon and crowding into the Mall, we can infer that the Columbia students and the Harvard students are the protestors responsible for those events. It is however left completely vague who was at which event, as desired. Thus, through the intervention of this vague participation relation ‘W’, we can represent (56) without committing all the students to both events.

The vagueness of ‘W’ can however lead to trouble elsewhere if we are not careful. So consider (62).

(62) The Columbia students and the Harvard students sneered at the Columbia students.

Sentence (62) is false if the Harvard students sneer at the Columbia students but no Columbia students do the same. But, a logical form along the lines of (63) is presumably true:

(63) $\exists e (W(e,c) \text{ and } W(e,h) \ \& \ [\exists x \text{Agent}(e, x) \ \& \ \text{sneer}(e) \ \& \ \text{At}(e,c)])$

There was an event in which both the Columbia students and the Harvard students participated, and that event was a sneering at the Columbia students. Granted that the Columbia students participated only as the victims and not as Agents, which makes (62) false, but (63) says nothing to require that Columbia students are Agents and it comes out mistakenly as true.

This outcome is avoided if it turns out that the event of being sneered at, in which the Columbia students participated as victims, is not the same event as the event of sneering, which the Harvard students participated in as the sole Agents. If the *being* sneered at is not the same event

as the sneering at, then the logical form of a simple transitive sentence will again have to express a (causal) relation between them. Instead of (63), we should have something more like (64):

(64) $\exists e \exists e' (W(e,c) \text{ and } W(e,h) \ \& \ [\exists x \text{Agent}(e, x) \ \& \ C(e,e') \ \& \ \text{sneer}(e') \ \& \ \text{At}(e',c)])$

Recall now the worry is that the participation relation ‘W’ is too vague to distinguish the Columbia students’ participation as Theme and victims from participation as Agents. But, this proves not to be a problem for (64). The only way to participate in the event e in (64), and I mean e , the causal event, and not e' the event caused-- the *only* way to participate in e is to be an Agent. So, if (64) is the logical form for (62) and if the Columbia students fail to sneer at themselves, that is, fail to be Agents, then (62) will turn out false as required.

So let me now summarize this argument. The vagueness in the meaning of the multiple conjunction in (56) with respect to who was a what demonstration requires the vague participation relation ‘W’ in (61). But, the vagueness in this relation will confuse Agents and Themes in (62), unless the causative analysis of transitives in (64) makes the event of being an Agent and the event of being a Theme distinct events.

So altogether, we have seen that the logic of conjunction and conjunction reduction yields up two arguments for the causative analysis of transitive sentences: this last deriving from the meaning of multiple conjunction and the first concerning (48) and (49) where I had to guarantee that the Harvard students are the only cooks preparing the beets and so introduced the causative analysis in (54). Combining these two considerations, we arrive in (65) at the final logical form for (56):

(65) $\exists e_i \exists e'_j \exists e'' (W(e_i,c) \text{ and } W(e_i,h) \ \& \ O(\text{pro}_i, \text{pro}_j) \ \& \ [\exists x \text{Agent}(e'_j, x) \ \& \ C(e'_j, e'') \ \& \ \text{surround}(e'') \ \& \ \text{Theme}(e'', p)] \ \text{and} \ [\exists x \text{Theme}(e'_j, x) \ \& \ C(e'_j, e'') \ \& \ \text{crowd}(e'') \ \& \ \text{Into}(e'', m)])$

The Columbia students and the Harvard students surrounded the Pentagon and were crowded into the Mall.

So, the Columbia students and the Harvard students participated in some vague way, ‘W’ in (65), in what was a surrounding of the Pentagon and a being crowded into the Mall, the event referred to by pro_j in (65). The participation relation itself just says that they were there, but I mean to say that just what the Columbia students and the Harvard students did, that is, the event referred to by pro_i constitutes the event at the Pentagon and on the Mall, and so these events are asserted in (65) to coincide or exactly overlap. Now since the participation relation ‘W’ is true of all an event’s participants, it had better be that the only way to participate here is as a surrounder of the Pentagon or as one of those crowded into the Mall. Well, in (65), the surrounding the Pentagon, e' , is not the same event as the Pentagon’s being surrounded e'' . The students’ participation is related to the former, e' , where the only participants are in fact Agents as required. Similarly, the students’ participation is related to the crowding into the Mall, e' , and not to the Mall’s being crowded into, e'' .

The single conjunction of Predicate Phrases in (57) gets the final logical form in (66):

(57) The three Harvard students cooked up the Harvard beets and possibly garnished them with pearl onions. \Rightarrow

(66) (At last!)
 $\exists e_i \exists e'_j \exists e'' (W(e_i, h) \& O(\text{pro}_i, \text{pro}_j) \&$
 $[\exists x \text{Agent}(e'_j, x) \& C(e'_j, e'') \& \text{cook}(e'') \& \text{Theme}(e'', b)] \textit{and}$
 $\text{Poss}[\exists x \text{Agent}(e'_j, x) \& C(e'_j, e'') \& \text{garnish}(e'') \& \text{Theme}(e'', b) \& \text{With}(e'', o)])$

The sentence in (67) will allow me to draw your attention to a peculiar but crucial aspect of this analysis. As I said earlier, I assume that the higher theta role ‘W’ comes from a higher projection through which the subject is moved. Now notice in (69) that the VP-internal subject position, which I have assumed is the place for the Agent theta role, is closed off by an existential quantifier. Strictly speaking, it is semantically unrelated to the higher subject. The trace of the moved subject in (68) is not as in (70) to be translated as a variable bound by the subject.

(67) The Harvard students cooked.

(68) $[_{XP} \text{The Harvard students}_i [_X [_{VP} t_i [\text{cooked}]]]]$

(69) $\exists e_i \exists e'_j (W(e_i, h) \& O(\text{pro}_i, \text{pro}_j) \& [\exists x \text{Agent}(e'_j, x) \& \text{cook}(e'_j)])$

(70) $*\exists e_i \exists e'_j (W(e_i, h) \& O(\text{pro}_i, \text{pro}_j) \& [\text{Agent}(e'_j, h) \& \text{cook}(e'_j)])$

(69) says that there was this cooking event with Agents and its only participants, ‘W’, were the Harvard students. From these two remarks, we *infer* that the Harvard students were the Agents, but there is no direct statement of this fact. The chains derived by NP-movement do not seem to have much significance for interpretation.

Recall one of the reasons that force the VP subject position to be closed off with an existential quantifier. When there is a multiple conjunction as in (65), we cannot allow variables in the subject positions of the conjoined Verb Phrases to be bound by any of the Noun Phrases.

(65) (Multiple conjunctions)
 The Columbia students and the Harvard students surrounded the Pentagon and were crowded into the Mall.

(71) The Columbia students-*x* and the Harvard students-*y*
 a. $*[\text{Agent}(e, x \cup y) \& \text{surround}(e) \dots] \textit{and} [\text{Theme}(e, x \cup y) \& \text{crowd}(e) \dots]$
 b. $*[\text{Agent}(e, x) \& \text{surround}(e) \dots] \textit{and} [\text{Theme}(e, y) \& \text{crowd}(e) \dots]$
 Etc.

Any of the logical forms in (71) that would do so require the students to be in places that according to (65) they don't have to be. So, for example, (71a) says that there were both Harvard students and Columbia students both at the Pentagon and on the Mall, which is more than (65) requires. The subject positions inside these VPs cannot be directly related to the outside subjects.

Interestingly, this conclusion finds independent support in an unexpected place. Caroline Heycock in her *LI* paper "Asymmetries in Reconstruction" points out that the VP-internal subject hypothesis is inconsistent with the facts about pronoun coreference in (72) and (73).

(72) (Heycock 1995)
How pleased with the pictures Pollock_i painted in his_i youth do you think he_i really was?

(73) *He_i really was pleased with the pictures Pollock_i painted in his_i youth.

For if the Verb Phrase fronted in (72) contained a subject, it should be disjoint from the name *Pollock*, just as it is in (73). The inconsistency arises only if it is assumed, as Heycock implicitly does, that any subject of the fronted VP in (72) would be interpreted as coreferent to the subject pronoun *he*. If however the subject of the fronted VP is an existential quantifier closed off from any direct relation to the higher subject, the pronoun *he*, then we can respect disjoint reference condition between the name *Pollock* and the VP subject, as in (74).

(74) How $\exists y_j y_j$ pleased with the pictures Pollock_i painted in his_i youth do you think he_i was?

Like in (69), we only *infer* that Pollock and the person pleased with the pictures are the same. The disjoint reference effect observed in (73) is due to the relation between the name *Pollock* and the *highest* subject, the pronoun *he*. It seems that only existential quantification in (74) can reconcile the evidence-- largely syntactic but there is at least one other semantic argument-- for a VP-internal subject with the facts of disjoint reference. This result then converges with what the logic of conjunction independently requires.

Conclusion

In much recent work in syntax and semantics, the notion of θ -rôle does not stray very far from the idea that predicates have arguments: a predicate "V" with arguments x, y , and z , "V(x, y, z)" is said to assign a distinct θ -rôle to each of x, y and z . Even where θ -rôles are identified with distinct constituents as in (75), that analysis is confined to the lexicon. The logical syntax does not itself decompose the predicates, which remain polyadic primitives-- a verb with an arbitrary number of arguments.

(75) 'V(x, y, z, e)' is true of $\langle a, b, c, e \rangle \leftrightarrow V(e) \ \& \ \text{Agent}(e, a) \ \& \ \text{Theme}(e, b) \ \& \ \text{Goal}(e, c)$

But, our discussion of (76) has shown that the scope of conjunction reduction will in some cases include nothing more than a θ -rôle, from which it follows that θ -rôles are explicit, independent constituents in logical form, in logical syntax.

(76) The Columbia students and possibly the Harvard students formed the unbroken chain around the Pentagon.

The evidence of conjunction thus joins the rather different arguments I made in *Plurals and Events* for the same conclusion. The interaction of conjunction reduction with such invisibilia offers a challenge to those would suppose that syntactic structure is semantically transparent.

Apart from this tendentious claim, I have tried to show that *and* is always a propositional connective. It could not be otherwise in (76); since, any other way to compose the conjoined Noun Phrases misinterprets the sentence. As a consequence of this conclusion, Conjunction Reduction is restored, a sentence is held together by null pronominals that refer to the events described by its constituents, transitive sentences under the causative analysis have more constituents than we might have thought and the chains of NP-movement are meaningless as such.

The remaining examples on the handout advertise further evidence for a number of points raised here. (77)-(82) point to evidence from the switch reference markers of Hopi and Mojave that Noun Phrase conjunctions are indeed propositional-- evidence of a very different nature from my modal argument. (83)-(84) are one semantic argument and (55)-(102) are another for the causative analysis of transitive clauses. (101)-(104) are from an argument due to Greg Carlson showing on semantic grounds that VPs have internal subjects. And, finally, (105)-(107) illustrate further the nature of the pronominal reference to events that appears above as little *pro*.

Thank you.

So far in this talk I have cultivated a retro feel. Not just with the proposal to bring back conjunction reduction but also in the style of argument, which like an old piece of philosophical logic, has taken one sentence about the Columbia students and possibly the Harvard students and looking closely at what it really means drawn conclusions about how logical form ought to be. I won't make apologies for this, but you look a little nervous. So before I go on with my theme--fancy this.

Hopi-- real linguistics now-- marks switch reference, which typically expresses a relation between clauses. In some languages, conjunctions are so marked, and in Hopi, as Hale & Jeanne observe, DP-conjunctions are marked according to the following pattern. A conjunction of subjects is marked as DS for different subject as in (87) and a conjunction of objects is marked for SS as in (88).

(77) 'Itana ni-q 'itanu tumala'yta. (Hale & Jeanne 1976)
Our father and=DS our mother are working

- (78) Nu' 'it taavot ni-t 'it sowit niina. (Hale & Jeanne 1976)
 I this cottontail and=SS this jackrabbit killed

They point out the apparent evidence for conjunction reduction. The switch-reference marker marks after all a relation between clauses. So, (87) comes from “our father and our mother are working” where the conjoined clauses have different subjects, and (88) from “I killed this cottontail and I killed this jackrabbit” where the subjects are the same. But, they reject this interpretation, thinking like Aristotle, that conjunction reduction is impossible with collective predicates as in (89) and yet the switch-reference marker still appears.

- (79) Mi' tiyo'ya ni-q mi' manaw'ya naami yori
 The boy and=DS the girl saw each other

But, we can take the Hopi at face value, as evidence for Conjunction Reduction. The apparent DP-conjunction in (89) in fact conjoins the propositions based on theta roles. It is therefore no surprise that the switch-reference marker, which expresses a relation between propositions or clauses, should mark the DP-conjunction.

There is however a fly in the ointment. Consider the presumed logical form for (88):

- (80) $\exists e(\text{Agent}(pro, I) \ \& \ \text{kill}(e) \ \& \ (\text{Theme}(e, c) \ \text{and}=\text{SS} \ \text{Theme}(e, j)))$

In what sense can the conjoined propositions in (90) be said to have the same subject? If my conclusions are correct, it must be that the traditional view according to which the switch reference marker encodes the sameness or difference of the subjects is mistaken. In particular, it would be a mistake to try, as Dan Finer does, to reduce switch reference to a binding relation involving subjects. Rather, the switch reference marker must express some other relation between the propositions, one that is available even where there are no subjects, as in (67). It just so happens that more often than not this relation coincides with the sameness or difference of the subject if there are subjects. This coincidence accounts for the traditional identification of switch reference with sameness or difference of the subject. As it turns out, there is extensive discussion in the switch reference literature that addresses the empirical shortcomings of the traditional view. Much of it is summarized in Lesley Stirling's 1993 book *Switch-Reference and Discourse Representation*. For our purposes, it is interesting to note that the exceptions to the traditional identification go all ways: Clauses with obviously different subjects will sometimes get the SS marking, clauses with the same subject will sometimes get the DS marking, and clauses with no subjects (*weather* verbs, for example) will get one or the other depending on what is to be expressed. Stirling's view is that the switch-reference marker expresses a relation between the events denoted by the marked clauses. We needn't bother with her details, which are rather complicated and vary from language to language. We need only note that if it is a relation between events, then in principle, there is no reason it couldn't hold in (90).

- (81) 'iipa-ny-ch thinya'aak-ny-m havik-k hakoloth tayem-m (Munro 1980)
 man-dem-subj woman-dem-with two=SS go=pl-tns

‘The man and the woman went to Needles’

- (82) ‘inyech‘iipa-ny-ch thinya’aak-ny-m havik-m ‘-iyuu-pch (Munro 1980)
I man-dem-subj woman-dem-with two=DS 1-see-perf
‘I saw the man and the woman’

My answer to the contrast between (14) and (15) has been to up the decomposition. 'Assassinate' is 'cause-to-be-assasinated'. (15) reports truly that Jackie saw the caused event, and (14) reports falsely that she saw the causal event.

(83)(14) Jackie saw Oswald assassinate JFK.

(84)(15) Jackie saw JFK assassinated by Oswald.

But, I hadn't considered (17) and (18). I would have to claim that '-tion' never nominalizes the causal event so that both (17) and (18) derive from 'assassination of JFK by Oswald.'

(17) Jackie saw Oswald's assassination of JFK

(18) Jackie saw JFK's assassination by Oswald.

In support of this, I think it is odd to say any of (i)-(iii) of Oswald's retarded brother Jimmy, who was beside on him on the roof of the Texas Book Depository and believed that his brother was shooting pigeons in the park.

(i) Jimmy saw JFK assassinated by Oswald.

(ii) Jimmy saw Oswald's assassination of JFK.

(iii) Jimmy saw JFK's assassination by Oswald.

(iv) Jimmy saw Oswald assassinate JFK.

On the other hand, one can imagine a context for (iv) where it is enough that Jimmy saw Oswald pull the trigger. It seems that the locus of an assassination is always the victim.

Gerunds are once again more verbal, I think. So we have:

(v) Jackie saw JFK's being killed by Oswald.

(vi) Jimmy saw Oswald's killing JFK.

But, neither:

(vii) Jackie saw Oswald's killing JFK.

(viii) Jimmy saw JFK's being killed by Oswald.

I suspect that the judgments shift again with 'Oswald's killing *of* JFK' towards the nominal, but it's squishy.

- (85) The fear of people Gore-i insulted years ago, he-i has yet to overcome.
- (86) *His-i fear of people Gore-i insulted years ago, he-i has yet to overcome.
- (87) The personal threat to him-i of legislation that Newt Gingrich-j could sponsor, he-j lets no politician-i forget.
- (88) *His-j personal threat to him-i of legislation that Newt Gingrich-j could sponsor, he-j lets no politician-i forget.

The examples in (81)-(84) are given solely for the benefit of those among you who would resort to various devious means, which I won't mention unless you do, for getting around Heycock's basic argument. These examples simply reinforce her point. It seems that only existential quantification can reconcile the evidence-- largely syntactic but there is at least one semantic argument-- for a VP-internal subject with the facts of disjoint reference. This result then converges with what the logic of conjunction independently requires.

Appendix (November 1992)

If one holds with Generalized Conjunction that the surface syntax is transparent to semantic composition, there are few ways out from the conclusion that *and* is ambiguous. Schwarzschild (1991) holds that, at least, conjoined definite descriptions are unambiguously interpreted via the union-operator. The suggestion is that some of (i)'s readings should be distinguished only pragmatically.

- (i) The Hungarians and the Romanians enjoy unequal rights.

Observing that (ii) entails (iii) when *the animals* refers to just the cows and the pigs, Schwarzschild points out that the plural predication in examples like (iii) must itself allow that the objects referred to be separated in different ways.

- (ii) The cows and the pigs were separated.
 (iii) The animals were separated.

This vagueness in plural predication allows it to be claimed that *the animals* and *the cows and the pigs* refer to the same object, the one obtained *via* a union-operator, $\{x: Cx \vee Px\}$. Strictly speaking, both (ii) and (iii) are true of all the ways the animals might be separated, male from female, for example, and Schwarzschild provides contexts that bear this out. But, (ii), unlike (iii), raises to salience a particular way of separating them, separating the cows and the pigs. The raising to salience of this way of separating the animals accounts for the appearance of a semantic difference between (ii) and (iii).

This pragmatic account succeeds where plural predication allows the objects referred to to be distributed among possibly distinct groups satisfying the predicate. Let us consider the

behavior of conjoined definite descriptions with those classes of predicates discussed in Dowty (1986) and Taub (1989) that disallow this semi-distributive interpretation. The exact characterization of these classes is the subject of their papers. Here it suffices that they exist.

- (iv) The trees are dense in the middle of the forest.
- (v) * The trees are all dense in the middle of the forest.

- (xv) The Apostles are twelve.
- (xvi) *The Apostles are all twelve.

- (vi) The logs were gathered into various piles.
- (vii) The logs were all gathered into various piles.

Thus, (iv) does not allow the trees to be distributed among scattered but dense clusters; and, as Dowty observes, the distributing *all* is ungrammatical. A predicate like *dense* contrasts with *gather*. Although it is essentially collective, *all* occurs grammatically in (vii) and it is understood in (vi) and (vii) that the trees are distributed among distinct gatherings. Note that the predicate in Schwarzschild's example (iii) also allows *all*:

- (viii) The animals were all separated (into a number of pens).

The conjoined NP in (ix) is still ambiguous despite the restriction on the predicate. One meaning is that the trees, elms and beeches, are dense; and, the other is that the elms are dense and so are the beeches.

- (ix) The elms and the beeches are dense in the middle of the forest.
- (xvii) The Saints and the Apostles are twelve.

For Schwarzschild, both readings are to be derived from an unambiguous reference to the trees, $\{x: Ex \vee Bx\}$. The latter reading would then require the trees be distributed among distinct dense clusters, according to whether they are elms or beeches. But, this construal of the predicate is unavailable, as we have just seen.

(iv) and (ix) are a very different pair from (ii) and (iii):

- (ii) The cows and the pigs were separated.
- (iii) The animals were separated.
- (ix) The elms and the beeches are dense in the middle of the forest.
- (iv) The trees are dense in the middle of the forest.
- (xvii) The Saints and the Apostles are twelve.
- (xix) The Holy Fathers are twelve.

Given the acknowledged vagueness of (iii), that the animals-might be grouped in different ways, it is plausible to suggest that the salience of cows and pigs in (ii) resolves it. But, (iv) and (ix) place a special burden on the pragmatics, if one wants to maintain that their subjects refer to the

same thing. There is no relevant vagueness in (iv) to be resolved, since it holds only if the objects denoted form a single dense cluster. One would have to say that the salience of elms and beeches nevertheless creates the chance for the predicate to be interpreted as required.

Even if we were willing to elaborate the pragmatics in this way, there remains a compelling objection. The sentence in (x) is unambiguous. It cannot mean that the elms are dense and the beeches are dense.

- (x) The trees which are elms and beeches are dense in the middle of the forest.
- (xx) The Holy Fathers who are Saints and Apostles are twelve.

Yet, there is nothing in the notion of salience to suggest that elms and beeches are salient in (ix) but not in (x). Failing the pragmatic account, we are left to conclude that the ambiguity in (ix) is semantic.

Given the syntactic assumptions, (ix) shows that, even within the limited domain of conjoined definite descriptions, *and* is seen to be ambiguous between the union-operator, which derives the interpretation equivalent to (iv), and a Boolean operator, deriving the interpretation that the elms are dense and the beeches are too.

An argument similar to the one presented above shows that, within the assumptions of syntactic compositionality, conjoined definite descriptions will also require an *and* that is a set-operator.

- (xi) *The integers are (all) equinumerous.
- (xii) The odd integers and the even integers are equinumerous.
- (xiii) *The integers which are odd numbers and even numbers are equinumerous.
- (xiv) *The odd integers are equinumerous and the even integers are equinumerous.

The ungrammaticality of (xi) and (xiii) show that the subject of the acceptable (xii) does not refer to the integers, $\{x: Ox \vee Ex\}$, as the union-operator would have it. Of course, the meaning of (xii) is not derived by the Boolean operator (*cf.* (xiv)). The predicate does however apply sensibly to the object with only two members, the odd integers and the even integers, $\{\{x:Ox\}, \{x:Ex\}\}$. Its members are equinumerous. There is, therefore, an *and* that is the set-operator, deriving this reference for the subject of (xii).